Air pollution and health: study of the biological effects in children by buccal micronucleus assay

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Background
The EU funded MAPEC_LIFE project evaluated the associations between air pollutants and a biomarker of early effect, the micronuclei (MN) frequency, in children living in five Italian towns (Brescia, Torino, Pisa, Perugia and Lecce), considering also lifestyle and socio-demographic features.
Methods
MN assay was performed in epithelial buccal cells from children in three seasons, meanwhile the air pollution exposure was evaluated by measuring several parameters. A questionnaire on socio-demographic and life-style features was spread to children's parents. For statistical analysis, count of MN was considered as response variable in regression analysis and a multivariate Poisson regression mixed models were applied.
Results
In the first winter season, the 52,7% of children showed at least one micronucleus in cells, with a mean MN frequency of 0.44 MN/1000 cells. The comparison between the towns showed statistically significant different level ($p = 0.013$). In spring season, MN frequency was lower than in winter (0.22 MN/1000 cells, $p = 0.001$), the difference between towns disappears and the percentage of positive children was lower too (35.9%). In the third season, again in winter, both MN (0.40 MN/1000 cells) and positive children (48.1%) increased. MN frequency resulted associated with the levels of benzene, PM2.5, ozone, SO2 and polycyclic aromatic hydrocarbons (PAHs). The multivariate Poisson regression models revealed the increase of the risk of having MN for one-unit increase of these pollutant levels, that was: 20.1% for benzene; 1.1% for PM2.5; 1.3% for ozone; 4.2% for SO2; 1.7% for PAHs. Season and town turned out to influence MN, as well as other questionnaire's factors: environmental tobacco smoke and high BMI were positively associated with MN frequency, while adherence to Mediterranean diet was negatively associated.
Conclusions
Our results confirmed that MN test applied to children buccal mucosa cells can detect early effects of air pollution exposure.

Key messages:

- The assessment of biomarkers of early effect in the population (micronucleus test) is useful for a complete overview of the impact of air pollution exposure.
- The obtained results can be used to propose some guidance for implementing policies of public health protection.